Solutions, Gases and Titrations Map

Edexcel A Level Chemistry · Topic 5 Formulae, Equations and Amounts of Substance · Calculations with Solutions and Gases

1 Concentration

5.11 a-b

- **c = n ÷ V**, V in dm³ (cm³ ÷ 1000)
- **n = c × V**
- g dm⁻³ = mol dm⁻³ × M
- Ions: $CaCl_2$ gives 2 × Cl^-
- n = c × V for any reactant or product



2 Standard solutions

5.7 c-d

- Weigh by difference
- Dissolve; transfer **with rinsings**
- **Volumetric flask**: make up to the mark
- Invert to mix
- Dilution: **moles unchanged**

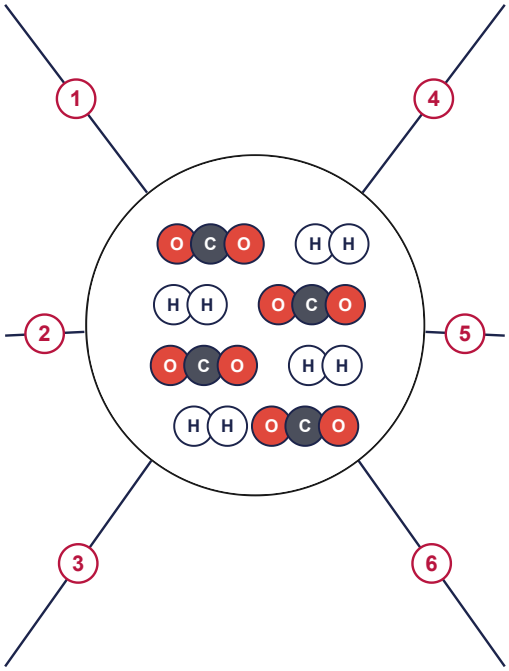


3 Titrations and indicators

5.11 c-e

- Pipette into flask; burette to the **end point**
- Mean of **concordant** titres (within 0.10 cm³)
- Ratio from the equation, then ÷ volume
- **Phenolphthalein**: colourless → pink
- **Methyl orange**: red → yellow; end point orange

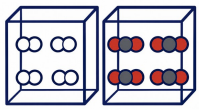




4 Molar volume

5.9, 5.10

- **Avogadro**: equal volumes, equal molecules
- **24.0 dm³ mol⁻¹** at r.t.p.
- V = n × 24.0; n = V ÷ 24.0
- Gas coefficients = **volume ratios**
- Leave out liquids; add leftover gas



5 The ideal gas equation

5.5 c

- **pV = nRT**, R = 8.31 J mol⁻¹ K⁻¹
- p in **Pa**, V in **m³**, T in **K**
- cm³ × 10⁻⁶; dm³ × 10⁻³; °C + 273
- Rearrange before substituting
- Volatile liquid: M = m ÷ n



6 Core Practical 1

5.9, 5.12

- Mg + excess HCl; collect H_2
- **Gas syringe** (CO_2 dissolves in water)
- Molar volume = V ÷ n
- Graph: **gradient × A_r(Mg)**
- Oxide or lost gas: too low; warm gas: too high



Units and conversions

convert every quantity before substituting; give answers to the data's significant figures

Quantity	Given in	Calculate in	Convert
Volume	cm³ or dm³	m³	cm³ × 10⁻⁶; dm³ × 10⁻³; dm³ = cm³ ÷ 1000
Pressure	kPa	Pa	kPa × 1000
Temperature	°C	K	°C + 273
Concentration	g dm⁻³	mol dm⁻³	÷ M (× M to go back)
Titre	cm³	dm³	÷ 1000 before n = c × V
Gas amount	dm³ at r.t.p.	mol	÷ 24.0 dm³ mol⁻¹

Worked examples

A dilution

- 25.0 cm³ of 0.100 mol dm⁻³
- made up to 250 cm³
- **0.0100 mol dm⁻³**

A titration

- 25.0 cm³ NaOH; 12.40 cm³ of 0.0500 H_2SO_4
- n(NaOH) = 2 × 6.20 × 10⁻⁴
- **0.0496 mol dm⁻³**

pV = nRT

- 250 cm³, 101 kPa, 25 °C
- (101 000 × 2.50 × 10⁻⁴) ÷ (8.31 × 298)
- **0.0102 mol**

Titres, gas volumes and masses carry uncertainties: see Uncertainty and Practical Safety. pV = nRT returns in energetics and equilibria.

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